IN THE DRAWINGS

Please replace Fig. 1 with the replacement sheet attached hereto wherein corrections have been shown in red ink.

REMARKS

Reconsideration of the above-identified patent application, as amended herein, is respectfully requested.

By means of the present Amendment, claim 1 has been amended and claim 2 has been cancelled. Accordingly, claim 1 is the only claim which is pending in this application.

In the Office Action dated April 29, 2005, the Examiner objected to the drawings because of the misspelling of the word "Figur." By means of the present Amendment, a replacement sheet for Figure 1 is attached hereto wherein this misspelling has been corrected.

In the Office Action dated April 29, 2005, the Examiner also rejected the claims under 35 U.S.C. 103(a) as being unpatentable over US 5,666,841 (Seeger et al.) in view of US 5,333,480 (Berstein). According to the Examiner, Seeger discloses a method of deep-rolling a notch component having a radius using a first rolling tube (6) which is used to work-harden the component by developing compressive stress through rolling. The rolling tube (6) rolls the component on adjacent tracks which are tangent to one another. In col. 7, lines 35-48, Seeger discloses producing internal compressive stress to a depth of 1.5 mm. Seeger discloses the use of the second rolling tube (13) for re-rolling in order to cause further plastic deformation. According to the Examiner, Seeger does not disclose that the second rolling tool has a smaller radius than the first rolling tool. However, Berstein teaches that it is known to use a roller with a decreased diameter in order to provide an increased compressive stress in a workpiece, citing col. 10, lines 43-56. Thus, the Examiner concluded that it would have been obvious to one skilled in the art at the time of the invention to substitute a smaller roller as taught by Berstein for the

larger roller of Seeger in order to increase a compressive stress while applying a smaller rolling force (or using a similar rolling force as for the first roller). The Examiner also asserted that in col. 7, lines 25-34, Seeger discloses that a larger rolling force is necessary for the roller (13) of increased size. Therefore, the Examiner concluded that the skilled artisan what would have been motivated at the time of the invention to use differing roller sizes with increased or decreased rolling force in order to effect compressive stress as taught by Berstein.

However, for the reasons set forth below, as well as for other reasons, it is believed that claim 1 is not rendered unpatentable by the combination of Seeger et al. and Berstein. In particular, the method according to Seeger et al., is directed to work-hardening the retention grooves of turbine blades (Seeger et al., col. 1., line 22; col. 2, lines 1-3; col. 3, lines 10-13; col. 6, lines 40-50; col. 6, line 57; col. 7, line 3; Figs. 3, 4).

The object of Seeger et al is to provide a method for work-hardening a component to be loaded along a loading axis by rolling along a plurality of tracks being directed approximately at right angles to the loading axis (Seeger et al., Abstract; col. 1, lines 12-18; col. 2, lines 57-59; col. 5, lines 39-43; Fig. 1). Rolling takes place in adjacent tracks, each of which covers part of the notch, so that the compressive internal stresses are directed towards the loading axis after the work-hardening has been completed. Such compressive internal stresses are particularly suitable for intercepting loads which occur along the loading axis (Seeger et al., col. 3, lines 1-10; col. 6, lines 10-31; Fig. 2; col. 7, lines 36-48; Fig. 6).

Components like turbine blades are subjected to large operational centrifugal loads (Seeger et al., col. 1, lines 26-28). Those centrifugal loads express themselves in large tensile stresses in the direction of the longitudinal axis of the blades.

Contrary to this, crankshafts are mainly loaded by bending stresses during their actual use. Bending stress is not considered at all in Seeger et al..

According to Seeger et al., rolling takes place in a first step with a roller having a small curvature and after that, possibly but not necessarily, in a second step with a second roller having a larger curvature.

For the first step, a roller 6 has a maximum crown radius 7 markedly smaller than the minimum radius of curvature 4 of the notch 3 to be produced. Consequently, multiple rolling by the roller 6 is necessary for work-hardening by rolling all of the positions along the notch 3, i.e., the adjacent and partially overlapping tracks 5 (col. 5, lines 52-62; col. 6, lines 16-20; Figs. 1, 2; col. 7, lines 4-12; Fig. 5).

The roller 13 used for the second step can have a maximum crown radius which corresponds approximately to the minimum radius of curvature 4. That roller 13 might be used to subject the notch 3 to finish-rolling after the work-hardening has taken place, particularly for smoothing the surface of notch 3 (col. 7, line 66; col. 6, line 5; col. 7, lines 13-14; Fig. 5).

Seeger et al. also describe the application of roller 6 and roller 13 to a test piece 2 in order to compare their method with the results achievable with the prior art according to which rollers with a curvature adapted to the curvature of the notch to be produced are used. For that test, a roller 6 having a radius of 1.5 mm is rolled in the left notch 3 along eleven tracks having centers

which are 0.5 mm apart under a varying load of 2.8 kN. For the purpose of comparison, a roller 13 having a radius of 3.8 mm is then applied on the other side of test piece 2 six times with loads of 10 kN, 20 kN and 30 kN, each force being exerted twice (Seeger et al., col. 7, lines 15-34; Fig. 5). Obviously, the disclosed forces were chosen in relation with to radii of the rollers in order to obtain comparable results, depicted in Figures 6 and 7, as far as the internal compressive stresses are concerned (Seeger et al., col. 7, line 36; col. 8, lin 4; Fig. 6, 7).

US 5,333,480 (Berstein) relates to a method for straightening workpieces which are bent or out of true, i.e., crankshafts, which have undergone a deformation during a preceding work-rolling process (Berstein, Abstract; col. 3, line 67; col. 4, line 25; col. 4, lines 43-44).

Truing is achieved by locally limited hardening by means of work-rolling in order to achieve higher compressive residual stresses and/or a deeper surface layer zone affected by these relative to the previously existing hardening of the workpiece (Berstein, col. 6, lines 2-11).

According to Berstein, rolling with a roller 25 is performed with different forces F1 and F2 in the respective circumferential ranges b1 and b2 of a lengthwise rotated workpiece 1. In this way, compressive residual stresses are induced in a surface layer zone 2. The depth of the surface layer zone 2 and the amount of compressive residual stresses are determined by varying the forces F1 and F2 and/or the diameter of the roller 25 (Berstein: col. 5, line 5-15; fig. 1, 2; col. 10, line 15; col. 11, line 12)

To summarize the above:

According Seeger et al., first a roller with a small radius and a first load is applied rolling along a number of adjacent tracks, and afterwards a second roller with a large radius and larger

load might be used. In contrast to that, the present invention as set forth in the claims requires initially deep-rolling the transition with a large radius, and subsequently rerolling the same transition with a small radius, the latter explicitly not being along a number of tracks.

In contrast to the present invention, according to Berstein the forces applied to the surface of the workpiece during the straightening operation are not constant. In addition to that, according to Berstein, the effect of rolling the notch with a roll is varied by choosing different diameters. Contrary to this, according to the invention, the rolling with the second roll having a smaller radius is used only for re-rolling the transition.

Accordingly, it is believed that claim 1 is not rendered unpatentable by the combination of Seeger et al . and Berstein.

Finally, submitted herewith is a copy of the priority document, namely, a ribbon copy of DE 103 08 124.0. The Examiner is kindly requested to acknowledge receipt of the priority document.

In view of the foregoing, it is believed that the application is in condition for allowance and a favorable action on the merits is respectfully requested.

Respectfully submitted,

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Date: July 27, 2005

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Enclosure: Replacement Sheet for Fig. 1
Priority Document